

# DRAFT

## Georgia Performance Standards

7<sup>th</sup> Grade Life Science

### Standard 4—Science

Intermediate

The Living Environment

Student Work Sample

#### Context

This middle school science project was conducted to test the hypothesis that, “. . . irradiation will increase the rate of germination and increase the height of the plants . . .”.

#### Performance Indicators

Students can:

. . . recognize that traits of living things are both inherited and acquired . . .

. . . describe sources of variation in organisms and their structures and relate the variations to survival.

In order to test our hypothesis, we ordered ordinary radish seeds as the control and, as the variable, seeds irradiated with four different measurements: 4,000,000r, 500,000r, 150,000r, 50,000r. We planted five pots of each kind, with ten seeds in each pot. They were watered every other day with ninety milliliters of water and covered with saran wrap. Each day, we recorded the number of seeds germinated, then graphed the results. The heights were measured six days after they were planted.

Our hypothesis was proven incorrect. Irradiation worsened the growth of the plants. This experiment disproves the theory that the reason for the incredible growth of the seeds in “Jack and the Beanstalk” was that they were irradiated. Irradiation could not have increased the height of the beanstalk. The hypothesis to test next would be that ordinary radish seeds would germinate quicker than irradiated seeds and the ordinary plants would grow taller and healthier than those irradiated. In order to improve upon this experiment, we would plant the seeds in larger pots so as to give the plants more room to grow. In addition, we could observe the plants over a longer period of time. Future investigations we could do as an outgrowth of this one, are testing the effect of irradiation on different types of seeds and testing irradiation’s effect on the fruit of the seeds.

#### Commentary

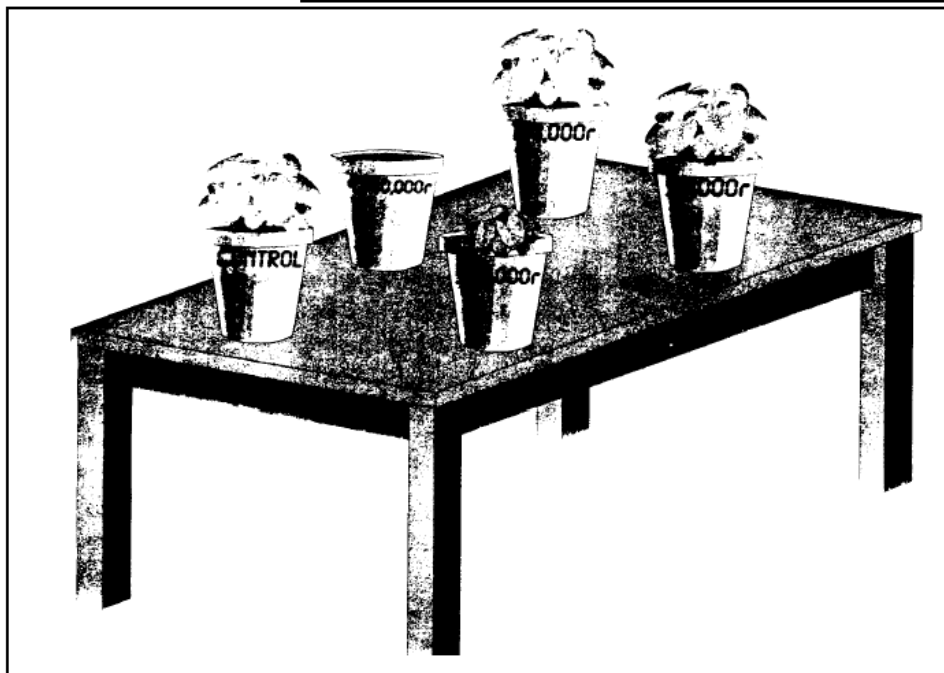
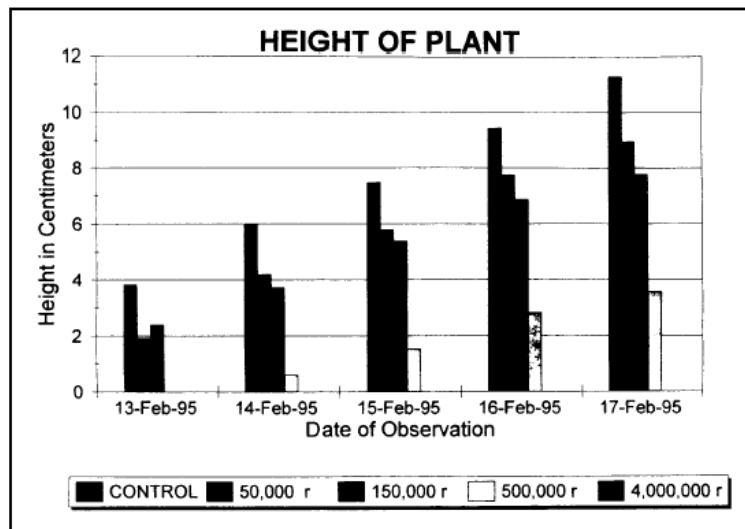
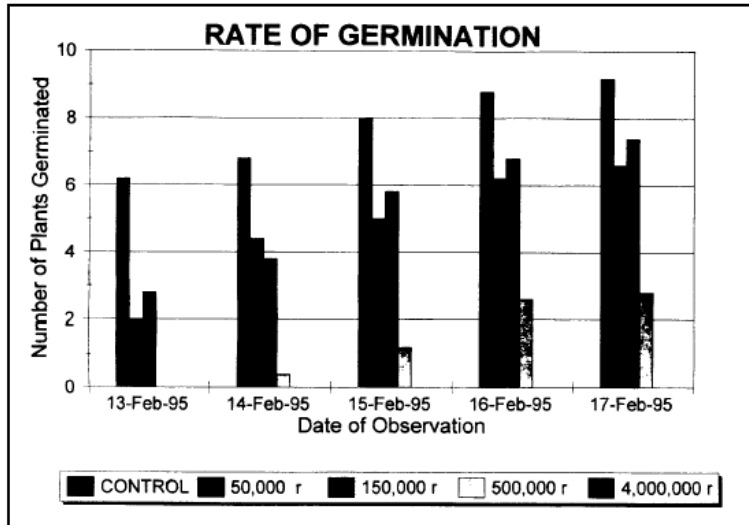
The Sample:

- States the hypothesis.
- Describes the preparation of seeds to encourage germination including the irradiated ones.
- Identifies manipulated and held constant variables.
- Describes experimental procedure.
- Represents plant growth and germination using computer generated graphics.
- Concludes that the hypothesis was flawed as evidenced by the charted data.
- Could be improved by presenting an explanation for the results, or plans to seek explanatory information.
- Identifies areas for further research.

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#### What the Work Shows:

##### Characteristics of Science

- SCSm1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.**
- Understand the importance of—and keep—honest, clear, and accurate records in science.
  - Understand that hypotheses are valuable if they lead to fruitful investigations, even if the hypotheses turn out not to be true.
- SCSm2. Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.**
- Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as integers, fractions, decimals, and percents.
  - Use the input units (such as seconds, square inches, or dollars per tankful) of scientific calculations to determine the proper unit for expressing the answer. Convert compound units (such as miles per hour into feet per second) in scientific expressions.
  - Decide what degree of precision is adequate, and round off the result of calculator operations to enough significant figures to reasonably reflect those of the inputs.
- SCSm3. Students will be able to use tools and instruments for observing, measuring, and manipulating objects in scientific activities.**
- Use computers to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.
  - Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various magnitudes.
  - Learns and uses on a regular basis standard safety practices for laboratory or field investigations.
  - Learns and uses safety procedures specific to an investigation or research activity.
- SCSm5. Students will be able to communicate scientific ideas and activities clearly.**
- Write clear, step-by-step instructions for conducting scientific investigations, operating something, or following a procedure.
  - Understand and describe writing for scientific purposes that incorporates circle charts, bar and line graphs, two-way data tables, diagrams, and symbols.
  - Organize scientific information in simple tables and graphs, and identify relationships they reveal.
- SCSm8. Students will be familiar with the character of scientific knowledge and how it is achieved.**
- When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often takes further studies to decide. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct.
- SCSm9. Students will understand important features of the process of scientific inquiry.**
- Investigations are conducted for different reasons, which include exploring new phenomena, checking on previous results, testing how well a theory predicts, and comparing different theories. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and creating explanations to make sense of the collected evidence.
  - If more than one variable changes at the same time in an experiment, the outcome may not be clearly attributable to any one variable. Therefore, scientists often collaborate to design research that is able to account for such situations.
  - When designing investigations and examining data, scientists are aware that their expectations can affect both what they observe and what they miss. To prevent this type of bias, the scientific enterprise uses such strategies as having different investigators conduct independent studies of the same questions.
  - Accurate record keeping, data sharing, and replication of results are essential for maintaining an investigator's credibility with other scientists and society.
  - Computers are valuable scientific instruments because they speed up and extend people's ability to collect, store, compile, and analyze data, prepare research reports, and share data and ideas with investigators all over the world. Science is often stimulated by developments in technology and mathematics to address old questions in new ways.

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#### Life Science Content

**S7L4. Students will be aware of the dependence of all organisms on one another and their environments.**

- a. Students will generate data that supports the fact that changes in environmental conditions can affect the survival of both individuals and entire species.

**S7L6. Students will be familiar with the development of living organisms and their changes over time, including inherited characteristics that lead to survival of organisms and their successive generations.**

- b. Students will research changes in generations of organisms to determine how their physical characteristics have changed.
- c. Students will describe ways in which species on earth may have changed over time due to selective breeding or environmental conditions.